

# Perforating veins of the shin in human fetuses

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*There are 3 groups of perforating veins of the shin: the medial, the lateral and the internal sural perforating veins. Dysfunction of these veins is one of the main factors in venous hypertension. There is a lack of data in the literature concerning perforating veins of the shin in human fetuses. The aim of this study was identification of the perforating veins of the shin in human prenatal development. The material examined included 88 human lower limbs of fetuses (21 males and 23 females) aged from 16 to 38 weeks of intra-uterine life. The perforating veins were dissected under a stereomicroscope. The number of perforating veins was analysed in relation to the sex of the foetus and the side of a body. In our study perforating veins of the shin did not show sexual or syntopic dimorphism. Between 2 and 6 Cockett's perforating veins were constantly present. Of these veins 80% divided into ascending and descending branches. Fibular perforating veins were found more often (90.9%) than Boyd's perforating veins (21.6%). Between 1 and 3 fibular perforating veins were observed but in 9% of cases they were entirely absent.*

**Key words:** medial group of perforating veins, fibular perforating vein, great saphenous vein, small saphenous vein

## INTRODUCTION

The perforating veins (PVs) connect the superficial veins to the deep veins. There are 3 groups of perforating veins of the shin: medial, lateral and internal sural perforating veins [1, 7, 9, 11–13, 19, 23]. The medial group consists most often of 3 perforators (Cockett's and Boyd's). These veins are found mainly at the intermuscular septa. The minor ones communicate with the small muscle veins while the major ones communicate with the main deep veins. The major PVs situated medially above the ankle differ from the rest in running a short (1 cm) and unprotected course from the subcutaneous fat to the posterior tibial veins through the wide gap between the soleus and the tibia [12]. The lateral group is made up of fibular perforating veins [7, 12]. Internal sural perforating veins connect the intramuscular veins of the soleus and the medial belly of the gas-

trocnemius muscles with the great saphenous vein [11]. Dysfunction of the perforator veins is one of the main factors in venous hypertension [3, 7, 20]. Proximally situated medial perforator veins (Boyd's) are responsible for the recurrence of varicose veins after surgical treatment, [21] while distally situated medial perforator veins (Cockett's) and lateral group PVs are a cause of ulceration of the shin [7, 17]. The aim of this study was the identification of perforating veins of the shin in human prenatal development.

## MATERIAL AND METHODS

The material examined consisted of 88 human lower limbs of fetuses taken from the collection of the Department of Normal Anatomy. There were 21 males and 23 females ranging in age from 16 to 38 weeks of intra-uterine life. After preparation of the proximal part of the great saphenous vein, a uropline agent

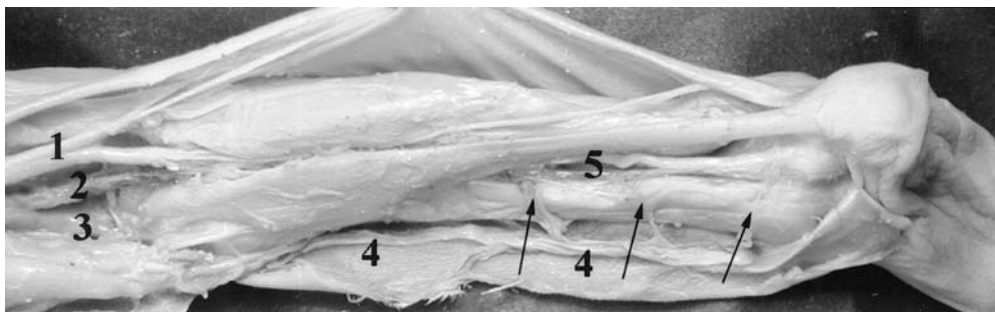
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was injected into it by means of an automatic syringe and radiograms were then made. Next an incision was made from the popliteal fossa to the calcanean tuber. The perforating veins were dissected under a stereomicroscope and documented by means of a Nikon Coolpix 950 digital camera. The number of perforating veins were analysed in relation to the sex of the foetus and the side of the body. The data were statistically analysed by means of Student's t-test for two independent variables ( $p < 0.01$ ).

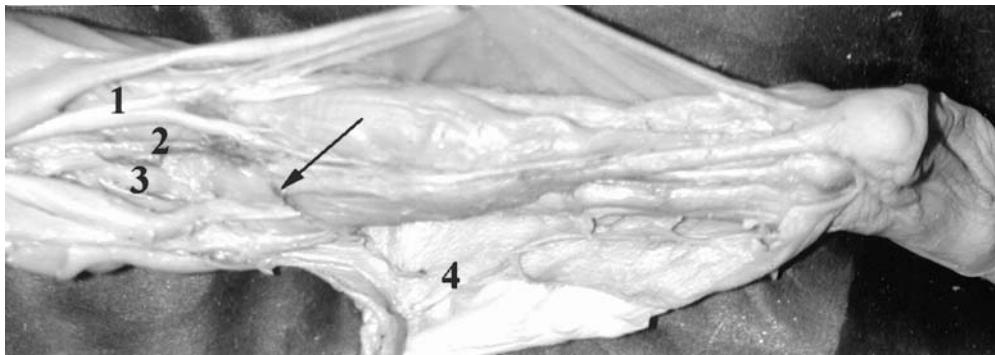
## RESULTS

In the material examined we identified the perforating veins of the shin. There were most often

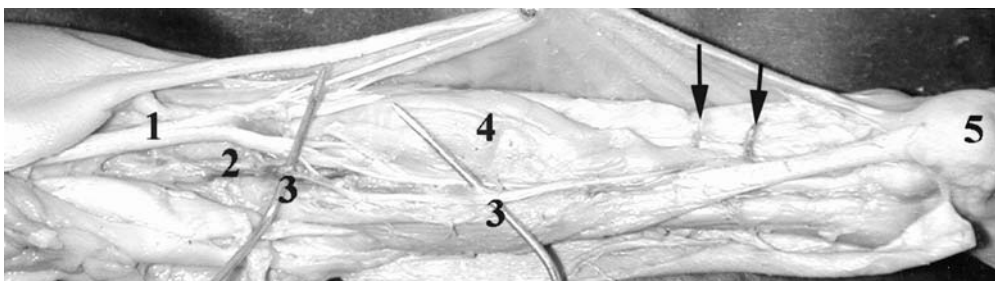
3 perforators on the medial side. In 80% of cases these veins divided into ascending and descending branches. The lowest medial PV (Cockett's) appeared above the medial malleolus and ran in a short course from the great saphenous vein to the posterior tibial veins between the superficial and deep group of crural flexor muscles (Fig. 1). The highest medial PV (Boyd's) connected the popliteal vein with the great saphenous vein (Fig. 2). We observed this PV in 21.6% of cases. It ran down from the popliteal fossa to the medial upper third of the shin and made an arch above the medial belly of the gastrocnemius muscle (Fig. 3). In 90.9% of cases 2 fibular perforating veins were present. These veins perforated the crural fas-



**Figure 1.** Medial group of lower shin perforators. Black arrows indicate Cockett's perforator. 1 — sciatic nerve, 2 — popliteal vein, 3 — popliteal artery, 4 — great saphenous vein, 5 — posterior tibial veins.



**Figure 2.** Medial group of upper shin perforators. Black arrow indicates Boyd's perforator. 1 — sciatic nerve, 2 — popliteal vein, 3 — popliteal artery, 4 — great saphenous vein.



**Figure 3.** Fibular perforating veins of the shin (black arrows). 1 — sciatic nerve, 2 — popliteal vein, 3 — small saphenous vein, 4 — lateral belly of the gastrocnemius muscle, 5 — calcanean tuber.

**Table 1.** The shin perforating veins in male and female foetuses in quantity characteristics. Data are expressed as mean and standard deviation

Age in months	Male foetuses (n = 21)						Female foetuses (n = 23)					
	The right limb			The left limb			The right limb			The left limb		
	Cockett	Boyd	Fibular	Cockett	Boyd	Fibular	Cockett	Boyd	Fibular	Cockett	Boyd	Fibular
4	2.5 ± 0.58	0.25 ± 0.5	1.25 ± 0.96	2.5 ± 0.57	0.25 ± 0.5	1.75 ± 0.5	2.5 ± 0.55	0.25 ± 0.54	1.25 ± 0.84	2.6 ± 0.54	0 ± 0	1.6 ± 1.14
5	3 ± 0.45	0.16 ± 0	2 ± 0.55	2.66 ± 0.54	0.16 ± 0.4	2.5 ± 0.55	2.5 ± 0.58	0 ± 0	2.5 ± 0.58	2.30 ± 0.5	0.25 ± 0.5	2.02 ± 0.5
6	2.8 ± 0.84	0.2 ± 0.44	2.2 ± 0.45	2.6 ± 0.54	0.4 ± 0.5	1.6 ± 1.14	3.5 ± 1.38	0.16 ± 0.40	1.83 ± 1.1	2.5 ± 0.54	0.25 ± 0.44	1.25 ± 1.14
7	3.75 ± 1.71	0.25 ± 0.5	2.5 ± 0.58	3.75 ± 0.95	0 ± 0	2.5 ± 0.58	3.2 ± 1.1	0 ± 0	2.2 ± 1.3	3.5 ± 0.89	0.25 ± 0.44	2.75 ± 0.54
8	3 ± 0	0 ± 0	3 ± 0	3.5 ± 1.38	1 ± 0.6	2.5 ± 1.04	2.72 ± 0.88	0.16 ± 0.44	2.42 ± 0.72	3 ± 0	0.66 ± 0.57	2.66 ± 0.57

cia and then ran between the deep flexor muscles and the peroneal muscles. These PVs connected the peroneal veins with the small saphenous vein. In the materials examined the internal sural perforating veins could not be identified. The quality of the radiograms was also insufficient for the evaluation of the shin perforators. The collective table shows the morphological characteristics of the shin PVs in male and female foetuses (Table 1). Statistical analysis revealed no gender dimorphism or syntopic differences in the material examined ( $p > 0.01$ ).

## DISCUSSION

The venous system of the lower limbs is composed of superficial and profound veins, which are connected on many levels by perforating veins. According to most authors, malfunctioning valves of the perforating veins are a cause of venous hypertension, which leads to disturbances in the macro- and microcirculation and then to ulceration [4, 5, 8, 14, 15, 23]. Taheri et al. [22] reports that malfunction of the venous system may also be conditioned by myopathy of the muscles of the lower limbs. According to various authors, irregularities in the venous circulation increase with age and affect between 20% and 60% of adults [18]. In children varicose are rare and those that are observed are more often congenital. In the foetus material examined no such congenital changes were observed. Dysfunction of Cockett's perforating veins may lead to venous ulceration, which is most often observable on the medial side of the shin. Subfascial ligation of malfunctioning Cockett's perforating veins was introduced by Linton [3, 17]. Many modifications of this method, depending on the localisation of the cut, were made by Lim et al. [16], De Palma [6] and Felder et al. [10]. In year 1985 Hauer invented a method of subfascial endoscopic cutting of malfunctioning perforating veins. In both methods 3 perforating veins were found most often [2, 20, 21]. In our study Cockett's veins were constantly observed in a larger number (between 2 and 6) than in the authors quoted. Discussion is restricted by the paucity of data in the literature concerning perforating veins of the shin in human foetuses. The only study on foetus material known to the authors focused on the valves of the great and small saphenous veins [4, 5].

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